Gas Well Development & Hydraulic Fracturing
FREQUENTLY ASKED QUESTIONS

Prepared by the Virginia Department of Mines, Minerals and Energy

What is "fracing?"

Much of Virginia's natural gas resources are not found in "conventional" subsurface reservoirs or large pools but are trapped in shale, coal or other rock formations. To access these gas reserves, the coal, rock or shale formations must be stimulated or "fraced." Fracing, which dates back to the 1940s, uses pressurized fluids and/or gases to stimulate or fracture rock or shale formations to release the natural gas. Sand pumped in with the fluids helps to keep the fractures open. The type, composition and volume of fluids used depend largely on regional geologic structure, formation pressure and the specific geologic formation and target for a well. Virginia's geology is different than that of other states where the Marcellus shale exists. The U.S. Geological Survey (USGS) has indicated a Marcellus play for Virginia is on the outer periphery of the major structural body of the shale. As a result, the concerns regarding conditions in other states are less likely to exist in the Commonwealth.

Has fracing been used in Virginia?

Fracing has been utilized in approximately 1,800 wells producing from shale, sandstone and limestone formations drilled in Southwest Virginia since the early to mid-1950's. More than 5,600 coalbed methane wells are producing from coal seams that have been naturally fractured after mining or have been fraced using water or foam. The fluids used in the fracing process in Virginia are mostly nitrogen-based with water, most commonly called a "foam" frac. Pressurized nitrogen-based foam is used to fracture certain formations of gas deposits. Due to the structure of geologic formations in Virginia, large volumes of water are not used in fracing because it may hinder or block the flow of gas within the formation.

In both nitrogen-based and water-based fracing, the trace ingredients in the fluids are typically used as friction reducers, gelling agents and antibacterials. The trace ingredients are mostly neutralized in the subsurface, and fracing operations do not result in concentrated volumes of chemical waste. The primary constituents of concern in fluids returned to the surface from fracing are chlorides and other salts that can lead to high conductivity. Additives remain a much diluted constituent in the returned waters.

Department of Mines, Minerals and Energy (DMME) requirements include the development of a stimulation plan. This plan addresses the specifics of how the well will be stimulated, including fracing fluids to be used, additives, and other factors.

Most wells in Virginia are drilled using air instead of water. If water is used it must meet or exceed regional water quality standards. No modern drilling activities for gas or coalbed methane include the use of diesel fuel.

What are DMME's Requirements to Protect Water Quality and the Environment?

DMME's regulatory framework serves to allow for safe and environmentally responsible production of Virginia's natural gas resources. DMME gas and oil permitting rules require the operator complete site-specific assessments of the surface and underground conditions to be affected by drilling, to ensure that operations will not cause off-site disturbances or pollution to surface or groundwater.

Virginia Gas and Oil Act: § 45.1-361.44. Replacement of water supply.
If any water supply of a surface owner who obtains all or part of his supply of water for domestic use from a water well has been materially affected by contamination or partial or complete interruption proximately resulting from a gas well operation within 750 feet of the water well, the operator of such gas well shall promptly provide a replacement water supply which shall be capable of meeting the uses such water supply met prior to the contamination or partial or complete interruption.

There have been no documented instances of surface water or groundwater degradation from fracing in Virginia.

Surface and groundwater protection is achieved largely through casing and fluid management requirements that must be met when drilling and stimulating a well. Multiple layers of steel pipe and concrete extend through groundwater zones to provide protection and prevent the intrusion of water into a gas flow stream.

Cemented casing is required at least 300 feet below the surface or 50 feet beneath the deepest known groundwater horizon, whichever is deeper. **Typically, fracing occurs in formations that are at least 500 feet (for coalbed methane wells), and often thousands of feet (for conventional gas wells) below fresh water zones.** These requirements are to ensure protection of groundwater from fracing fluids and its trace ingredients. With nearly 7,500 natural gas and coalbed methane wells drilled in Virginia, there have been no documented instances of surface water or groundwater degradation from fracing activities.

DMME regulations also protect water quality once fracing fluids return to the surface.
Typically, only about 15-30% of injected fracing fluids return to the surface. Once returned to the surface, the fracing fluids must be stored in lined pits until ready for permanent disposal. All gas well sites are “closed loop" systems. No off-site disturbances or discharges are allowed. Fracing fluids are disposed in an off-site permitted facility such as a Class II EPA waste disposal well or are land applied after meeting regulatory requirements.

DMME regulations also govern on-site road and gathering pipeline construction and operation. Construction must meet all erosion and sediment control, storm water, and reclamation requirements, and all these activities are covered under performance bonds.

Who has primary regulatory authority over natural gas and oil wells in Virginia?

DMME is the regulatory authority for statewide gas and oil permitting and operations. Interstate pipelines and gas storage fields are under the jurisdiction of the State Corporation Commission. Virginia inspectors have experience with more than 1,800 active conventional vertical and horizontal gas wells in other formations, including Devonian-age shale(s).

How often are the gas wells inspected by DMME?

DMME uses a risk-based inspection process in Virginia. This means inspectors are present during the most critical stages of well development – site construction, drilling, fracing, and reclamation. Once the well is producing, there is a substantially reduced risk of problems. DMME continues to inspect the site through the life of the well. Also, at this point, gas company well tenders, on average, are visiting conventional well sites once per week and coalbed methane wells two to three times per week to check production meters and well site conditions. Virginia law requires that companies immediately notify DMME of any onsite or offsite problems related to the well, pipeline or facility.

Does DMME consult any other governmental agencies (national, state, or local) during the permit application review process?

During the permit review process, research is conducted concerning the proposed well site, including contacts with the U.S. Forest Service and/or the Virginia Department of Forestry. The applicant is required to contact agencies that require additional site permitting, including the Virginia Marine Resources Commission, Virginia Department of Transportation and others. The number of agencies contacted by DMME and the applicant will vary on a site by site basis.

Do drilling companies have to identify the chemicals they are using in the hydro-fracturing process?

Although companies were not required to identify all chemicals being used, a new website was recently established by the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission (IOGCC) for that purpose. Funded by the U.S. Department of Energy, this landmark, web-based national registry discloses the chemical additives used in the hydraulic fracturing process on a well-by-well basis, starting with wells drilled in 2011. Visit the website at www.fracfocus.org.

Is there a risk of radioactivity in the solids and water produced during the drilling and hydro-fracturing process?

Naturally Occurring Radioactive Materials (NORM) from rock formations and minerals are a common phenomenon. While this potential risk is known to be present in all drilling, it is believed to be an extremely low risk due to the geology in Virginia.

How are waters produced back during drilling and fracing handled?

Virginia regulations provide for land application of fluids if lab tests, conducted by an independent lab, show the fluids meet water quality standards. If the produced fluids do not meet quality standards, the operator is required to transport fluids to an approved Class II EPA waste disposal well or other properly permitted facility.

Regulations require an independent lab test of any water well or spring within 500 feet of a proposed well bore before drilling begins.

Water used during the drilling process is required to meet state water quality standards by-region. This could be water drawn from a stream or river or well. Public Service Authority water may also be used, if preferable and available.

The well casing/cementing program for each well is designed to protect ground water resources and coal seams below the surface. Virginia's casing program is a multi-casing and cementing program with the cement circulated to surface. This prevents contamination of groundwater, protects the coal resources, and isolates the gas production.

The Virginia Gas and Oil Act and Regulations do not allow off-site impacts or discharges to surface waters.

For additional information, contact:

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